NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

TECHNICAL MEMORANDUM 48

A PETROL-PROOF FLEXIBLE TUBING AT LAST

An Invention of the Greatest Importance to Aviation.

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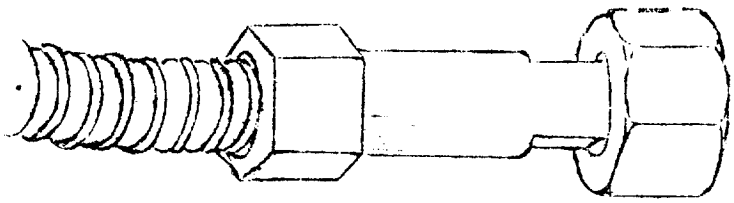
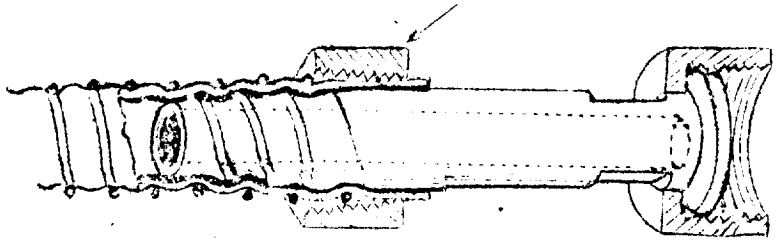
It is an old saying that a chain is only as strong as its weakest link. Similarly, the installation of an aircraft engine is only as reliable as its weakest spot. It is by now fairly well established, and accepted, that the modern aero engine is in itself a very reliable prime mover, and that what gives trouble is not so much the engine itself as its accessories and auxiliaries. If, therefore, we are to have any hopes of improvements in the aero-engine, from the point of view of reliability, it is to the improvement in auxiliaries that we should first turn. Among these one of the worst or at any rate quite a bad - and frequent - offender is the petrol system, with its piping and, particularly, its joints. Copper pipes have been used almost exclusively, but, incorporate "vibration bends" as one may, flexible joints have still proved to be necessary. Now, although rubber can be made petrol-resisting, it cannot at present be made petrol-proof. If, as has sometimes been done, benzole is mixed with the petrol, the rubber joints fare even worse. So much so that they can scarcely be called benzole-resisting, let alone benzole-proof.





THE BLAISDELL PETRO-FLEX TUBING: A petrol and benzole-proof flexible tubing made from animal gut and reinforced with an outer fabric cover and a spirally-wound wire protector. The special unions should be noted.

Obviously, if a really reliable flexible tubing could be produced, which would at the same time be petrol and benzole-proof, a very great step would have been taken towards reliability in the fuel system. Such a tubing now appears to be available, and according to exhaustive tests, promises to do all that can reasonably be expected of any tube. The new flexible tubing, which is known as Blaisdell Petro-Flex, is the invention (or should one say

discovery?) of Mr. F. E. Blaisdell, who showed us the tubing in its original and somewhat crude form more than two years ago. At the time we considered the tubing very promising, and advised the inventor to continue his research work. This he has been doing, and the fact that the tubing has not been placed on the market until now is due to Mr. Blaisdell's policy that nothing short of perfection - as near as it is humanly attainable - was good enough for a petrol tube, on which so much depends in an aircraft.

The new tubing is manufactured and marketed by the Blaisdell Petro-Flex Tubing Co., Ltd., of Cassiobury Works, St. Albans Road, Watford, Herts. Briefly it consists of an inner lining of animal gut, covered by an outer cover of fabric, the whole being strengthened by a wire wound around the tube in a spiral. The petrol proof qualities of the tubing are, of course, due to the inner lining of gut. In order to ensure that no minute pin-holes exist, the inner lining is composed of a number of layers of the gut, drawn over one another on a long mandrel. The layers are first well soaked in a special preparation, which makes them stick together and form a complete unit. When the inner tube is set sufficiently the outer fabric covering is put on and the tube is given the spiral groove, which forms the seating, so to speak, for the wire protector. The flatter projects beyond the exposed fabric, thus protecting it against abrasion as well as crushing.

The Union Terminals.

Not the least interesting feature of the Blaisdell Petro-Flex is the union, which has been specially designed for the tubing, and takes the place of the usual binding-wire or hose clip, with its projecting bolt and nut. In the Blaisdell union there is a male portion in gunmetal which has on it a coarse right-hand thread corresponding to the spiral groove in the tubing itself. This portion is screwed into the tube, and is locked in position by means of a nut, so proportioned that it will just pass over the end of the tubing. This nut has a tapering left-hand thread, so that, as it is screwed down, it makes its own thread on the tubing, and, just before being screwed right home climbs on to the end of the wire spiral, thus further locking the joint. The rest of the union, as will be seen from the sketch, is a standard fitting attaching to the tank, etc., in the usual manner. The grip which is obtained is so strong that the tubing and union have successfully withstood a tension of over 200 lbs. without showing any signs of giving way.

Tests with petrol under pressure and vibration tests on the tubing have also, we understand, given excellent results, and altogether it appears to us that here at last is a really satisfactory flexible petrol-proof tubing, eminently suitable for use on aircraft. It should be mentioned that the Blaisdell Petro-Flex is not only proof against petrol, but also against benzole, and, in short, all hydrocarbons. The tubing can be supplied in lengths of up to 15 ft. This represents the maximum length at the moment, owing to the decision of the makers not to use joints in the gut

lining. For most aeroplanes such lengths should be sufficient, and doubtless in time, if the demand should exist, ways and means will be found for making satisfactory joints in the inner tube. As regards size, the tubing is manufactured in internal diameters ranging from 3/16 in. to 2-in., so that there should be no difficulty in fitting any system likely to be met with. It might be argued that the flow in the pipes would be restricted by the internal corrugations. While this is probably so for high velocities, it is scarcely likely to have any appreciable effect at the rates of flow obtaining in a petrol supply system.

In conclusion it should be mentioned that the tubing can be supplied in short lengths to take the place of existing rubber joints, for cases where it is desired to maintain the metallic portion of the existing petrol system. Any further particulars will be supplied on demand by the Blaisdell Petro-Flex Tubing Co., Ltd., Cassiobury Works, St. Albans Road, Watford, Herts.